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Using Ultracapacitors as Energy-Storing Devices on a Mobile Robot Platform Power System for Ultra-Fast Charging

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Abstract: The large charging times required by conventional batteries constitute an important limitation in many applications. The use of ultracapacitors as energy storage elements allows substantially faster charging. This paper presents a power supply system developed in order to validate the possibility of providing a mobile robot platform with an electrical energy storage system based on ultracapacitors and batteries, ensuring both the autonomy and the charging time required by this vehicle. Both simulations results and experimental results – also presented in this paper – validate this possibility. Using exclusively one ultracapacitors module as energy-storing device of the new power supply system, the mobile platform achieved an autonomy of 22 minutes after a charging time of 1 minute and 57 seconds. The charging time is less than 10% of the autonomy time. The system also proved its ability to properly charge lead-acid batteries or nickel–metal hydride batteries, which may be used as energy-storing devices, allowing the mobile platform to achieve greater autonomy than the one obtained with ultracapacitors (at the cost of larger charging times).